Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

SPECIFICATION
FOR
APPROVAL

( ) **Preliminary Specification**
(◆) **Final Specification**

Title	19.0" SXGA TFT LCD

BUYER	
PROJECT	

SUPPLIER	LG.Philips LCD CO., Ltd.
*MODEL	LB190E01
SUFFIX	SL01

*When you obtain standard approval,
please use the above model name without suffix

SIGNATURE	DATE
/	
/	
/	

Please return 1 copy for your confirmation
With your signature and comments.

APPROVED BY C.S. Kyeong / G.Manager	DATE 06.15.2007
REVIEWED BY S.D. Jung / S.Manager	06.15.2007
PREPARED BY J.I. Im / Engineer	06.15.2007

Product Engineering Dept.
LG. Philips LCD Co., Ltd

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

Contents

No		ITEM	Page
		COVER	1
		CONTENTS	2
		RECORD OF REVISIONS	3
1		GENERAL DESCRIPTION	4
2		ABSOLUTE MAXIMUM RATINGS	5
3		ELECTRICAL SPECIFICATIONS	6
	1)	ELECTRICAL CHARACTERISTICS	6
	2)	INTERFACE CONNECTIONS	9
	3)	SIGNAL TIMING SPECIFICATIONS	13
	4)	SIGNAL TIMING WAVEFORMS	14
	5)	POWER SEQUENCE	16
4		OPTICAL SFECIFICATIONS	17
5		MECHANICAL CHARACTERISTICS	20
6		RELIABILITY	23
7		INTERNATIONAL STANDARDS	24
	1)	SAFETY	24
	2)	EMC	24
8		PACKING	25
	1)	DESIGNATION OF LOT MARK	25
	2)	PACKING FORM	25
9		PRECAUTIONS	26
	1)	MOUNTING PRECAUTIONS	26
	2)	OPERATING PRECAUTIONS	26
	3)	ELECTROSTATIC DISCHARGE CONTROL	27
	4)	PRECAUTIONS FOR STRONG LIGHT EXPOSURE	27
	5)	STROAGE	27
	6)	HANDLING PRECAUTIONS FOR PROTECTION FILM	27

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

RECORD OF REVISIONS

Revision No	Date	Page	Description
Ver 1.0	Ver 1.0		Final Specification

www.panelook.com

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

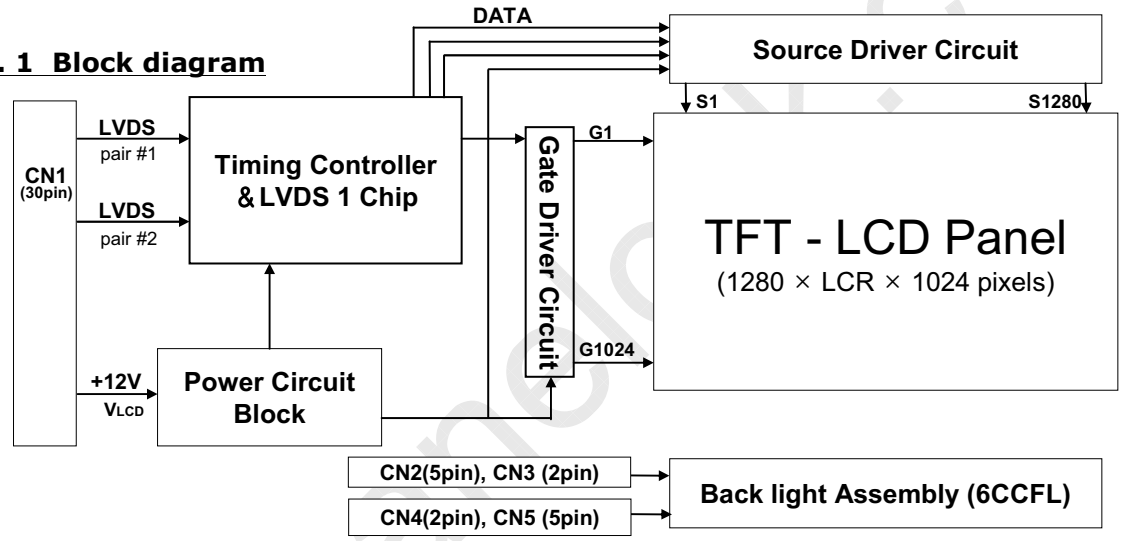
One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

1. General Description

LB190E01-SL01 is a Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp (CCFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. It has a 19.0 inch diagonally measured active display area with SXGA resolution (1024 vertical by 1280 horizontal pixel array), Gray scale or the brightness of the sub-pixel is determined with a 8-bit gray scale signal. It has been designed to apply the interface method that enables low power, high speed, low EMI. FPD Link or compatible must be used as a LVDS(Low Voltage Differential Signaling) chip. It is intended to support applications where thin thickness, wide viewing angle, low power consumption are critical factors and graphic displays are important. In combination with the vertical arrangement of the sub-pixels, the LB190E01-SL01 characteristics provide an excellent flat panel display for Medical (Mono) products such as monitors.

FIG. 1 Block diagram



General Features

Active screen size	19.0 inches (481.9mm) diagonal
Outline Dimension	396.0(H) x 324.0(V) x 20(D) mm(Typ.)
Pixel Pitch	0.294 (H)mm x 0.294(V)mm
Pixel Format	1280(H)X1024(V)pixels(1pixel consists of 3 sub-pixels (LCR).)
Interface	LVDS 2Port
Luminance, white	1,000 cd/m^2 (Center 1Point, typ)
Viewing Angle (CR>10)	R/L/U/D:85/85/85/85(Min.)
Power Consumption	Total 35.05Watt(Typ.), (6.7W@V_{LCD} , 28.35 W@Lamp)
Weight	2,586g(typ), 2,700g(max)
Display operating mode	Transmissive mode, normally Black
Surface treatments	Hard coating (3H), Anti-glare treatment of the front polarizer

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

2. Absolute Maximum Ratings

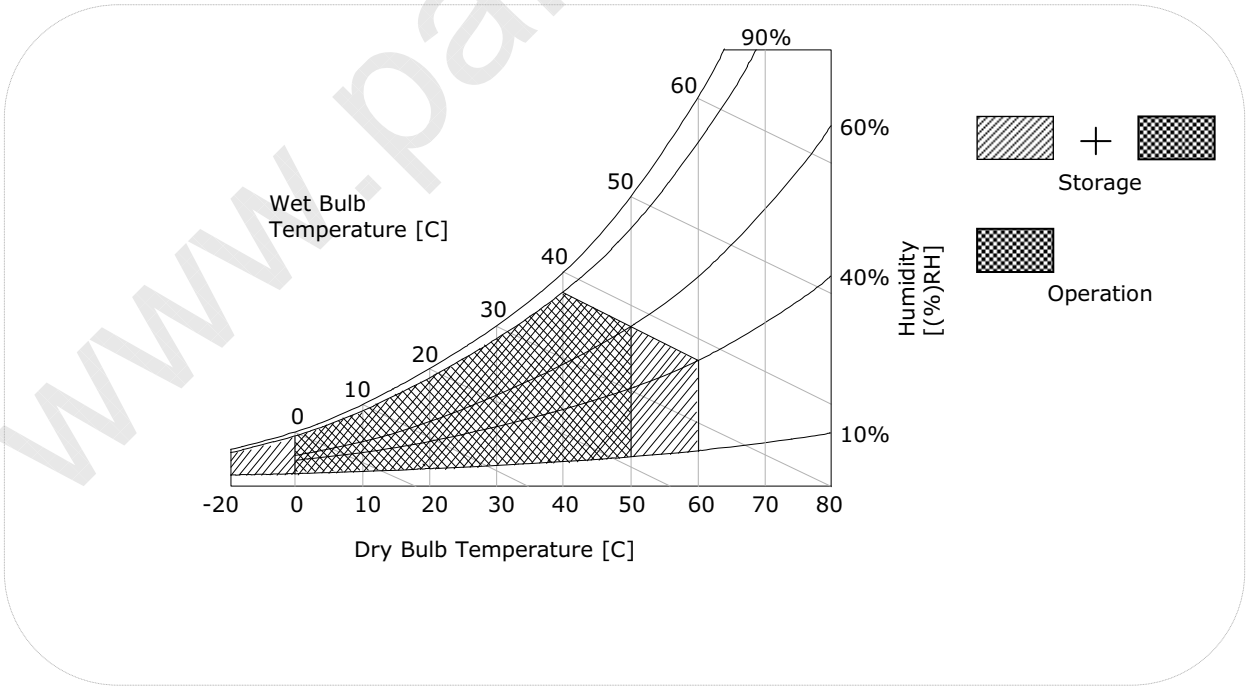
The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1. Absolute Maximum Ratings

Parameter	Symbol	Values		Units	Notes
		Min	Max		
Power Supply Input Voltage	V_{LCD}	-0.3	+14.0	Vdc	At 25℃
Operating Temperature	T_{OP}	0	50	℃	1
Storage Temperature	T_{ST}	-20	60	℃	
Operating Ambient Humidity	H_{OP}	10	90	%RH	
Storage Humidity	H_{ST}	10	90	%RH	

Note : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be under 39 ℃, and no condensation of water.

FIG. 2 Temperature and relative humidity



Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

3. Electrical Specifications

3-1. Electrical Characteristics

It requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input power for the CCFL/Backlight, is typically generated by an inverter. The inverter is an external unit to the LCDs.

Table 2. Electrical Characteristics

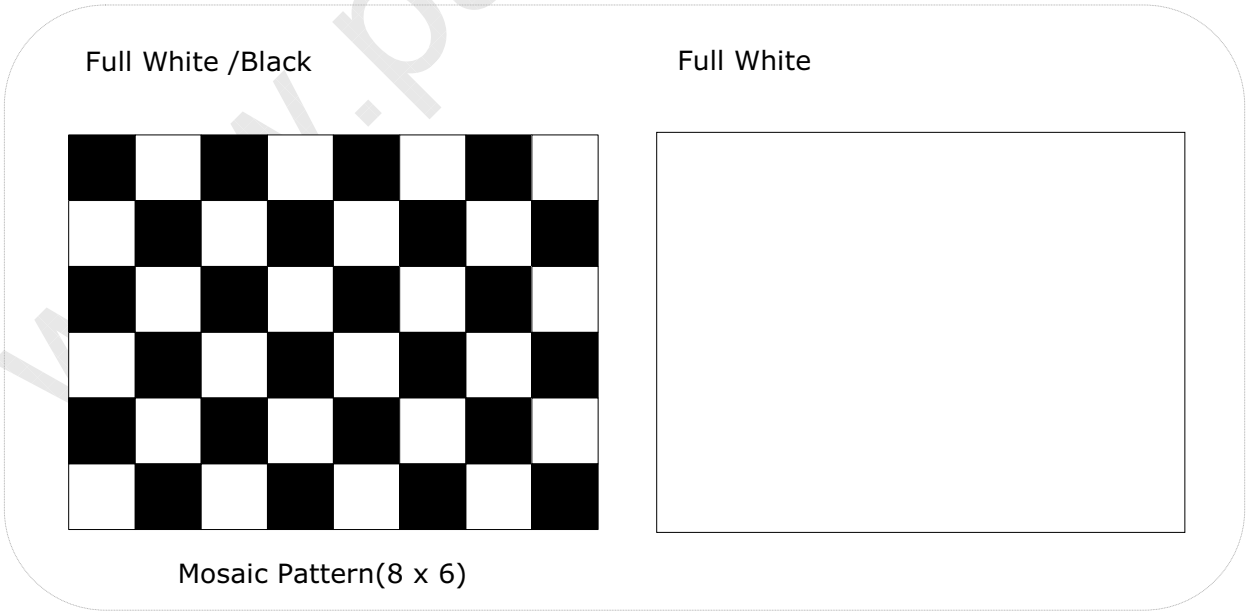
Parameter	Symbol	condition	Values			Unit	Notes
			Min	Typ	Max		
MODULE :							
Power Supply Input Voltage	V_{LCD}		10.8	12.0	13.2	Vdc	
Power Supply Input Current	I_{LCD}	Mosaic	-	420	483	mA	1
		White	-	555	638	mA	1
Power Consumption	P_{LCD}	White	-	6.7	7.7	Watt	1
Inrush current	I_{RUSH}	White	-	-	3	A	2

Note :

1. The specified current and power consumption are under the V_{LCD}=12.0V, 25 ± 2°C,f_V=60Hz condition whereas mosaic pattern(8 x 6) & white pattern are displayed and f_V is the frame frequency.

2. The duration of rush current is about 2ms and rising time of power Input is 500us ± 20%.

FIG.3 patterns for power consumption measurement



Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

Table 3. Electrical Characteristics

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
LAMP :							
Operating Voltage		V_{BL}	655(7.5mA)	675(7.0mA)	790(3.0mA)	V_{RMS}	1, 2
Operating Current		I_{BL}	3.0	7.0	7.5	mA_{RMS}	1
Established Starting Voltage		Vs					1, 3
	at 25 °C				1,050	V_{RMS}	
	at 0 °C				1,250	V_{RMS}	
Operating Frequency		f_{BL}	40	-	70	kHz	4
Discharge Stabilization Time		T_S	-	-	3	Min	1, 5
Power Consumption		P_{BL}		28.35	31.19	Watt	6
Life Time			45,000	-		Hrs	1, 7

Note :

The design of the inverter must have specifications for the lamp in LCD Assembly.
The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.
When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (no lighting, flicker, etc) never occurs. When you confirm it, the LCD–Assembly should be operated in the same condition as installed in your instrument.

※ Do not attach a conducting tape to lamp connecting wire. If the lamp wire attach to a conducting tape, TFT-LCD Module has a low luminance and the inverter has abnormal action.
Because leakage current is occurred between lamp wire and conducting tape.

1. Specified values are for a single lamp.
2. Operating voltage is measured at 25 ± 2°C. The variance of the voltage is ± 10%.
3. The voltage above V_S should be applied to the lamps for more than 1 second for start-up.
   (Inverter open voltage must be more than lamp starting voltage.)

Otherwise, the lamps may not be turned on. The used lamp current is the lamp typical current.

4. Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
5. Let's define the brightness of the lamp after being lighted for 5 minutes as 100%.
   T_S is the time required for the brightness of the center of the lamp to be not less than 95%.
6. The lamp power consumption shown above does not include loss of external inverter.
   The used lamp current is the lamp typical current. ($P_{BL} = V_{BL} \times I_{BL} \times N_{Lamp}$)
7. The life is determined as the time at which brightness of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2°C.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

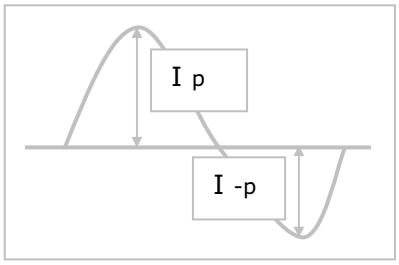
One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

8. The output of the inverter must have symmetrical(negative and positive) voltage waveform and symmetrical current waveform (Unsymmetrical ratio is less than 10%). Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave. Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp, are following.It shall help increase the lamp lifetime and reduce leakage current.

a. The asymmetry rate of the inverter waveform should be less than 10%.
b. The distortion rate of the waveform should be within $\sqrt{2}$ ±10%.

* Inverter output waveform had better be more similar to ideal sine wave.



* Asymmetry rate:

$| I_p - I_{-p} | / I_{rms} \times 100\%$

* Distortion rate

I_p (or I_{-p}) / I_{rms}

9. The inverter which is combined with this LCM, is highly recommended to connect coupling(ballast) condenser at the high voltage output side. When you use the inverter which has not coupling(ballast) condenser, it may cause abnormal lamp lighting because of biased mercury as time goes.
10. In case of edgy type backlight with over 6 parallel lamps, input current and voltage wave form should be synchronized

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

3-2. Interface Connections

- LCD Connector(CN1) : GT-101-30S-H16 (LS Cable) and IS100-C30B-C15(UJU) or Equivalent.
- Mating Connector : FI-X30H and FI-X30HL (JAE) or Equivalent.
- Interface chip must be used LVDS Part No. SN75LVDS83(Texas Instrument) or compatible.

Table 4. Module Connector(CN1) Pin Configuration

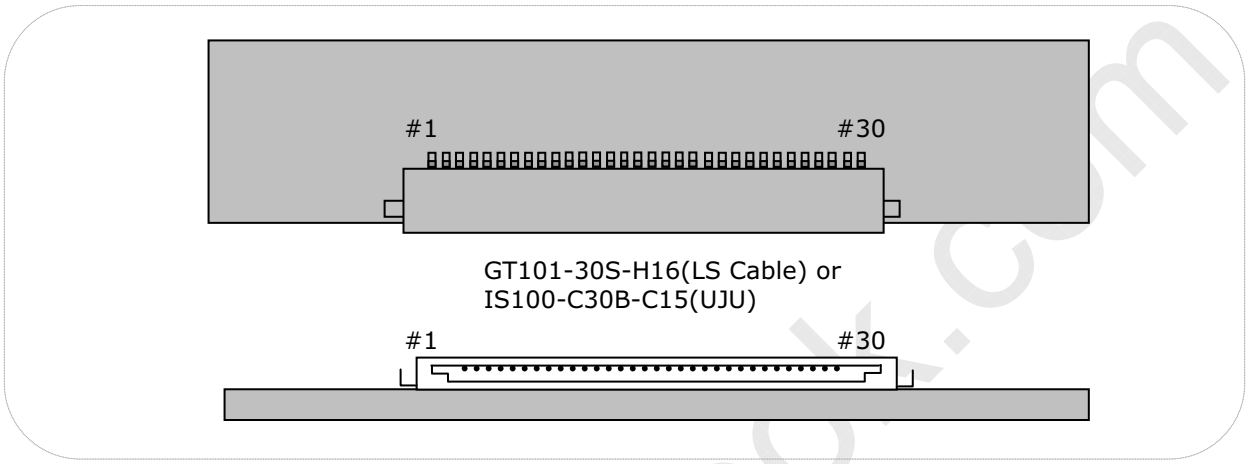
Pin No	Symbol	Description
1	RXO0-	Minus signal of 1'st channel 0 (LVDS)
2	RXO0+	Plus signal of 1'st channel 0 (LVDS)
3	RXO1-	Minus signal of 1'st channel 1 (LVDS)
4	RXO1+	Plus signal of 1'st channel 1 (LVDS)
5	RXO2-	Minus signal of 1'st channel 2 (LVDS)
6	RXO2+	Plus signal of 1'st channel 2 (LVDS)
7	GND	Ground
8	RXOC-	Minus signal of 1'st clock channel (LVDS)
9	RXOC+	Plus signal of 1'st clock channel (LVDS)
10	RXO3-	Minus signal of 1'st channel 3 (LVDS)
11	RXO3+	Plus signal of 1'st channel 3 (LVDS)
12	RXE0-	Minus signal of 2'nd channel 0 (LVDS)
13	RXE0+	Plus signal of 2'nd channel 0 (LVDS)
14	GND	Ground
15	RXE1-	Minus signal of 2'nd channel 1 (LVDS)
16	RXE1+	Plus signal of 2'nd channel 1 (LVDS)
17	GND	Ground
18	RXE2-	Minus signal of 2'nd channel 2 (LVDS)
19	RXE2+	Plus signal of 2'nd channel 2 (LVDS)
20	RXEC-	Minus signal of 2'nd clock channel (LVDS)
21	RXEC+	Plus signal of 2'nd clock channel (LVDS)
22	RXE3-	Minus signal of 2'nd channel 3 (LVDS)
23	RXE3+	Plus signal of 2'nd channel 3 (LVDS)
24	GND	Ground
25	NC	No Connection(LPL use only to adjust Common Voltage)
26	NC	No Connection(LPL use only to adjust Common Voltage)
27	NC	No Connection
28	V_{LCD}	Power Supply +12.0V
29	V_{LCD}	Power Supply +12.0V
30	V_{LCD}	Power Supply +12.0V

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

FIG. 4 Connector Diagram



Rear view of LCM

Note:

1. NC: No Connection.
2. All GND(ground) pins should be connected together and to Vss which should also be connected to the LCD's metal frame.
3. All V_{LCD} (power input) pins should be connected together.
4. Input Level of LVDS signal is based on the IEA 664 Standard.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

Table 5. Required Signal Assignment For Flat Link(TI:SN75LVDS83) Transmitter

Pin #	Pin Name	Require Signal	Pin #	Pin Name	Require Signal
1	VCC	Power Supply for TTL Input	29	GND	Ground pin for TTL
2	D5	TTL Input (R7)	30	D26	TTL Input (DE)
3	D6	TTL Input (R5)	31	T_X CLKIN	TTL Level clock Input
4	D7	TTL Input (G0)	32	PWR DWN	Power Down Input
5	GND	Ground pin for TTL	33	PLL GND	Ground pin for PLL
6	D8	TTL Input (G1)	34	PLL VCC	Power Supply for PLL
7	D9	TTL Input (G2)	35	PLL GND	Ground pin for PLL
8	D10	TTL Input (G6)	36	LVDS GND	Ground pin for LVDS
9	VCC	Power Supply for TTL Input	37	TxOUT3+	Positive LVDS differential data output 3
10	D11	TTL Input (G7)	38	TxOUT3−	Negative LVDS differential data output 3
11	D12	TTL Input (G3)	39	T_X CLKOUT+	Positive LVDS differential clock output
12	D13	TTL Input (G4)	40	T_X CLKOUT−	Negative LVDS differential clock output
13	GND	Ground pin for TTL	41	T_X OUT2+	Positive LVDS differential data output 2
14	D14	TTL Input (G5)	42	T_X OUT2−	Negative LVDS differential data output 2
15	D15	TTL Input (B0)	43	LVDS GND	Ground pin for LVDS
16	D16	TTL Input (B6)	44	LVDS VCC	Power Supply for LVDS
17	CLKSEL	CLKIN Wave form Selection	45	T_X OUT1+	Positive LVDS differential data output 1
18	D17	TTL Input (B7)	46	T_X OUT1−	Negative LVDS differential data output 1
19	D18	TTL Input (B1)	47	T_X OUT0+	Positive LVDS differential data output 0
20	D19	TTL Input (B2)	48	T_X OUT0−	Negative LVDS differential data output 0
21	GND	Ground pin for TTL Input	49	LVDS GND	Ground pin for LVDS
22	D20	TTL Input (B3)	50	D27	TTL Input (R6)
23	D21	TTL Input (B4)	51	D0	TTL Input (R0)
24	D22	TTL Input (B5)	52	D1	TTL Input (R1)
25	D23	TTL Input (RSVD)	53	GND	Ground pin for TTL
26	VCC	Power Supply for TTL Input	54	D2	TTL Input (R2)
27	D24	TTL Input (HSYNC)	55	D3	TTL Input (R3)
28	D25	TTL Input (VSYNC)	56	D4	TTL Input (R4)

Notes : Refer to LVDS Transmitter Data Sheet for detail descriptions.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

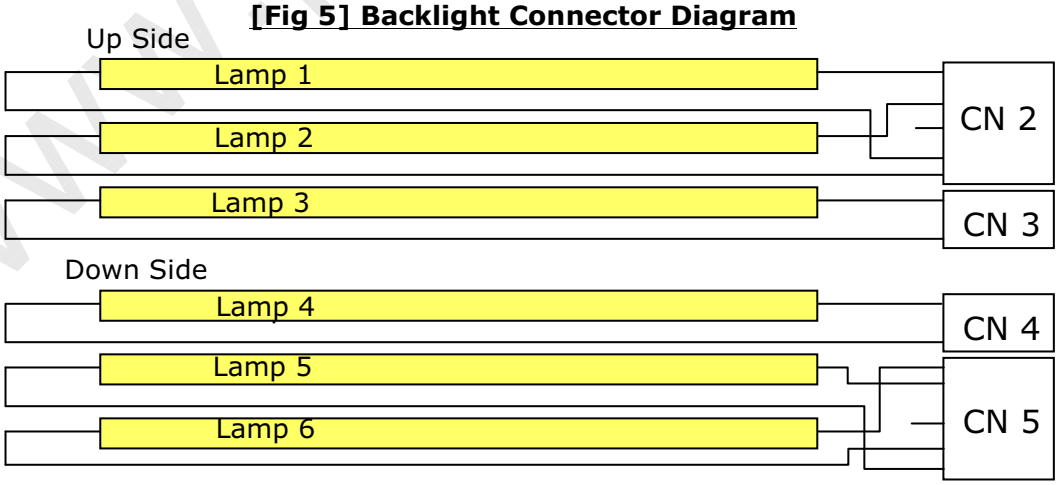
Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

The backlight interface connectors consist of BHR-05VS-1(CN2,CN5), BHSR-02VS-1(CN3,CN4) manufactured by AMP or equivalent.
Part numbers of mating connectors are SM02B-BHSS-1-TB(2pin),SM04(9-E2)B-BHS-1-TB(5pin)
or equivalent.
The pin configuration for connectors is shown in the table below.

[Table 6] Backlight Pin Configuration

No	Pin	Symbol	Description	Notes
CN2	1	HV	Power supply for lamp1(High Voltage side)	Gray
	2	HV	Power supply for lamp2(High Voltage side)	Sky Blue
	3	NC	NC	
	4	LV	Power supply for lamp1(Low Voltage side)	Black
	5	LV	Power supply for lamp2(Low Voltage side)	Blue
CN3	1	HV	Power supply for lamp3(High Voltage side)	White
	2	LV	Power supply for lamp3(Low Voltage side)	White
CN4	1	HV	Power supply for lamp4(High Voltage side)	White
	2	LV	Power supply for lamp4(Low Voltage side)	White
CN5	1	HV	Power supply for lamp6(High Voltage side)	Gray
	2	HV	Power supply for lamp5(High Voltage side)	Sky Blue
	3	NC	NC	
	4	LV	Power supply for lamp6(Low Voltage side)	Black
	5	LV	Power supply for lamp5(Low Voltage side)	Blue

[Fig 5] Backlight Connector Diagram



Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

3-3. Signal Timing Specifications

This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

Table 7. Timing Table

Parameter		Symbol	Min.	Typ.	Max.	Unit	Notes
D_{CLK}	Period	t_{CLK}	14.7	18.5	22.2	ns	
	Frequency	f_{CLK}	45.0	54.0	68.4	MHz	
Hsync	Period	t_{HP}	672	844	1022	t_{CLK}	
	Width	t_{WH}	8	56	358		
	Frequency	f_H	53.3	64.0	82.1	KHz	
Vsync	Period	t_{VP}	1034	1066	1320	t_{HP}	
	Width	t_{WV}	2	3	24		
	Frequency	f_V	47	60	76	Hz	
DE (Data Enable)	Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
	Horizontal Back Porch	t_{HBP}	8	124	366		
	Horizontal Front Porch	t_{HFP}	8	24	358		
			-	-	-		
	Vertical Valid	t_{VV}	1024	1024	1024	t_{HP}	
	Vertical Back Porch	t_{VBP}	5	38	124		
	Vertical Front Porch	t_{VFP}	1	1	148		
		-	-	-	-		
	DE Setup Time	t_{SI}	4	-	-	ns	For D_{CLK}
	DE Hold Time	t_{HI}	4	-	-		
Data	Data Setup Time	t_{SD}	4	-	-	ns	For D_{CLK}
	Data Hold Time	t_{HD}	4	-	-		

Notes

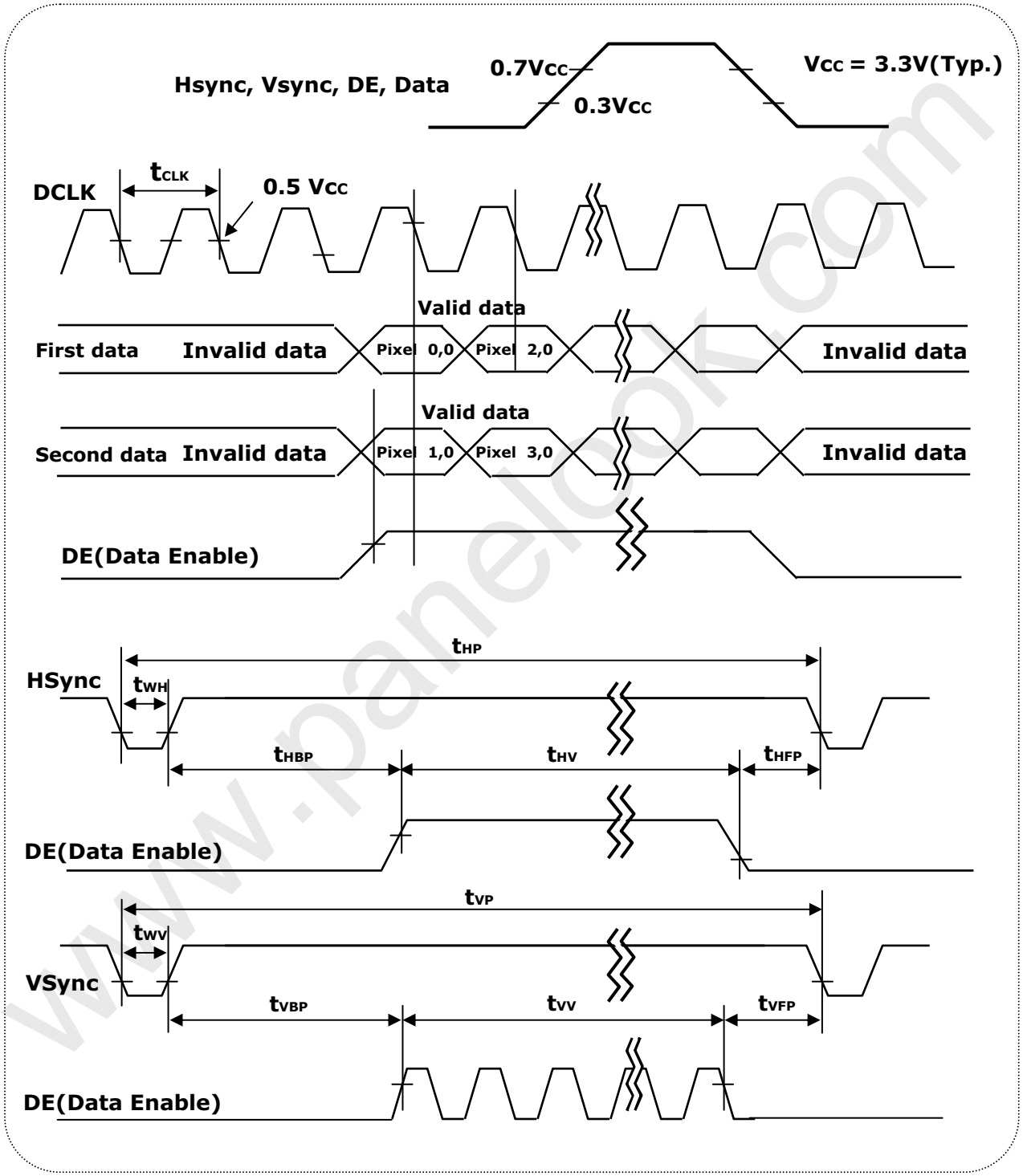
1. DE Only mode operation
2. $t_{HFP} + t_{WH} + t_{HBP} < (1/2)\ t_{HV}$
3. $t_{VFP} + t_{WV} + t_{VBP} < t_{H_max} / t_{v_min}$
4. tHFP, tWH and tHBP should be any times of a character number (8).
5. No variation of the total number of Hsync and DE in a frame is required for normal operation.
6. No variation of the total number of clock in a Hsync period for t_{VBP} is required for normal operation.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

3-4. Signal Timing Waveforms



Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

[Reference : Input Data]

The product can display 256 gray scales in each LCR sub-pixel and 766(2^8×3-2) gray scales per 1 pixel. The relation between displays gray scale and input signals is as the following table.

Table 8. Data Reference

Display gray scale		Input Data																							
		Left								Center								Right							
		MSB							LSB	MSB							LSB	MSB							LSB
		L7	L6	L5	L4	L3	L2	L1	L0	C7	C6	C5	C4	C3	C2	C1	C0	R7	R6	R5	R4	R3	R2	R1	R0
Left Sub pixel	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	- - - - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- - - - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bright	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Center Sub pixel	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	- - - - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- - - - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	White	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Right Sub pixel	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	- - - - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- - - - - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	White	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

3-5. Power Sequence

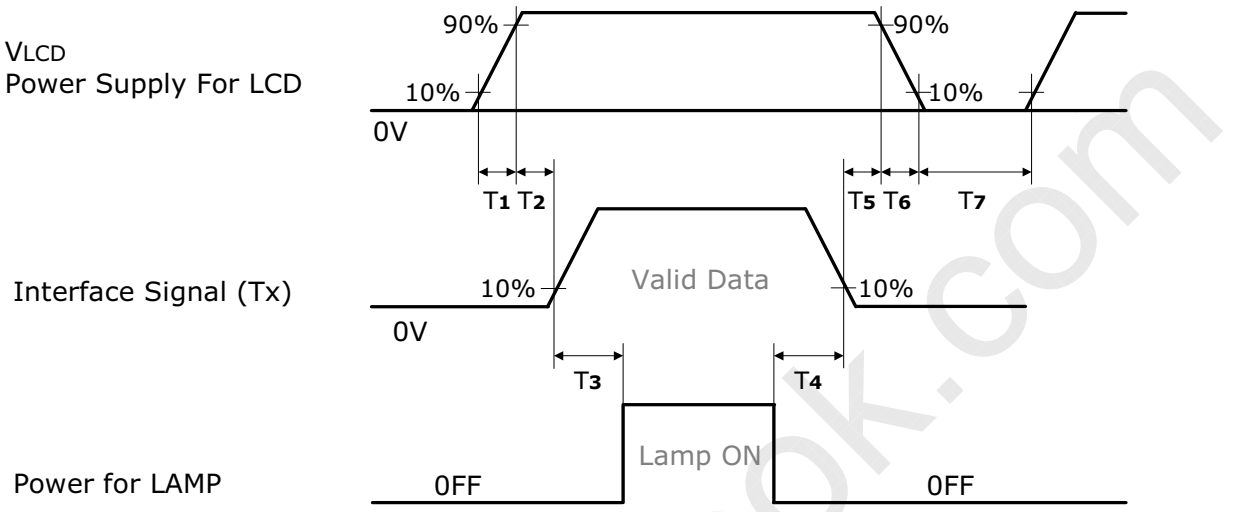


Table 9. Power Sequence

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0.0	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.0	-	50	ms
T6	0.5	-	10	ms
T7	500	-	-	ms

Notes :
1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply for LCD V_{LCD} to 0V.
3. Lamp power must be turn on after power supply for LCD an interface signal are valid.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' for 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
FIG. 7 presents additional information concerning the measurement equipment and method.

FIG. 7 Optical Characteristic Measurement Equipment and Method

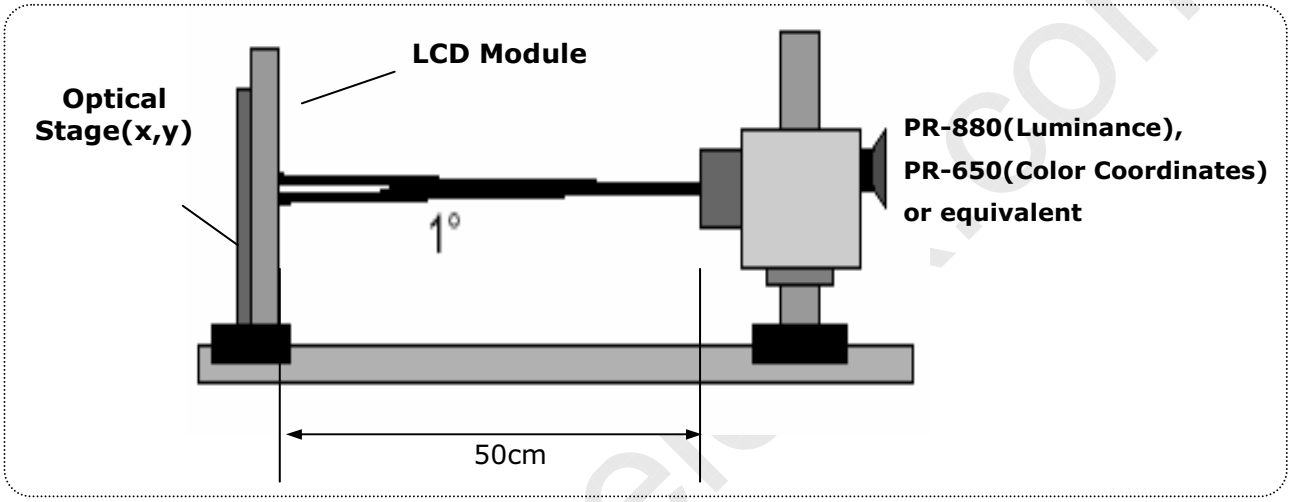


Table 10. Optical Characteristics

Ta= 25°C, V_{LCD}=12.0V, fv=60Hz
f_{CLK}=54MHz,I_{BL}=7.0mA

Parameter0		Symbol	Values			Units	Notes
			Min	Typ	Max		
Contrast Ratio		CR	600	900	-		1
Surface Luminance, white		L_{WH}	800	1,000	-	cd/m²	2
Luminance Variation		δ_{95gray} 5P	0.8	-	1.2		3
White Balance		Wx	0.257	0.272	0.287		4
		Wy	0.293	0.313	0.333		4
Response Time	Rise Time	Tr_R	-	11	14	ms	5
	Decay Time	Tr_D	-	14	16	ms	5
View Angle (CR > 10)	x axis, right(ϕ=0°)	θr	85	-	-	Degree	6
	x axis, left (ϕ=180°)	θl	85	-	-	Degree	6
	y axis, up (ϕ=90°)	θu	85	-	-	Degree	6
	y axis, down (ϕ=270°)	θd	85	-	-	Degree	6

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

Notes :

1. Contrast ratio(CR) is defined mathematically as :

$$\text{Contrast ratio} = \frac{\text{Surface luminance with all white pixels}}{\text{Surface luminance with all black pixels}}$$

It is measured at center point(M1)

2. Surface luminance is the luminance value at center 1 point(M1) across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 8.

3. The variation in surface luminance at 95 gray level, δ_{95gray} is defined as

$$\delta_{95gray}(\text{Luminance variation}) = \frac{\text{Luminance from P1,P2,P3,P4}}{\text{Luminance from M1}}$$

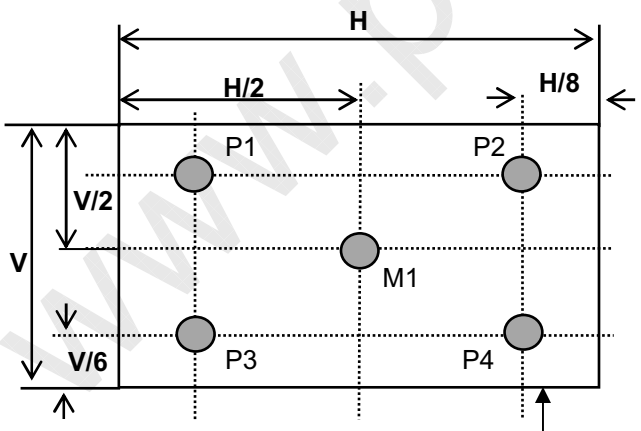
For more information see FIG 8.

4. White Balance is the chromaticity at center 1 point(M1) across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 8.

FIG. 8 Luminance Measuring Point

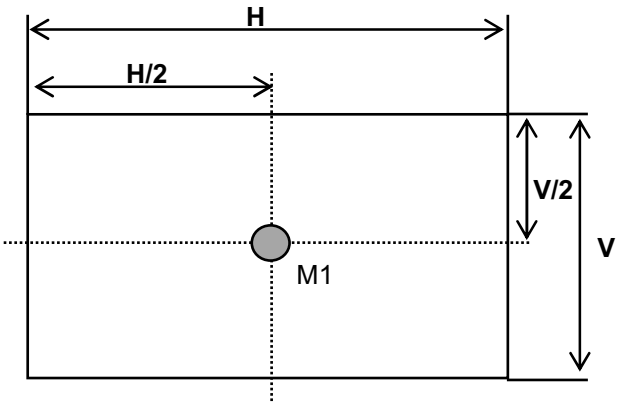
<Measuring point for surface luminance and luminance variation>

<Measuring point for luminance variation>



H : 376.320 mm
V : 301.056 mm
@ H,V : Active Area

<Measuring point for surface luminance>



Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

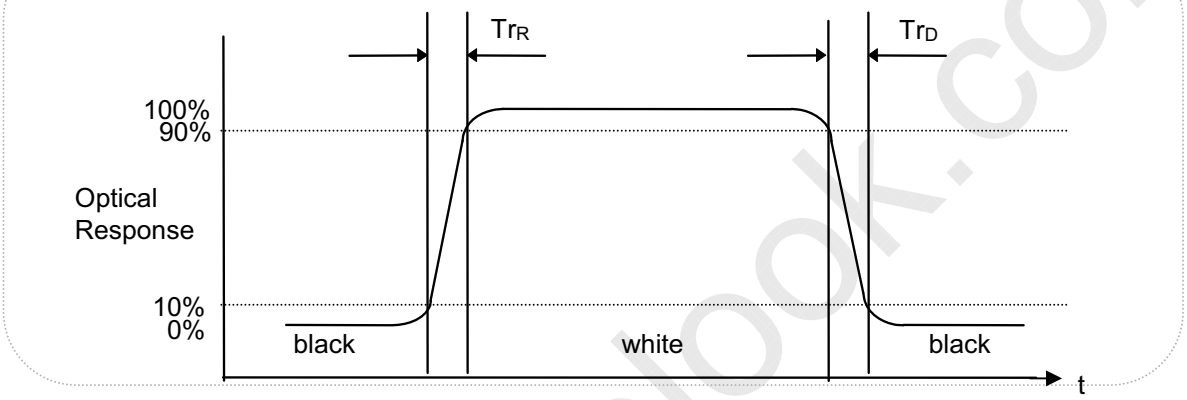
One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

5. Response time is the time required for the display to transition from black to white (Rise Time, Tr_R) and from white to black (Decay Time, Tr_D)
The sampling rate is 2,500 sample/sec. For additional information see FIG. 9.

The response time is defined as the following figure and shall be measured by switching the input signal for each gray to gray.

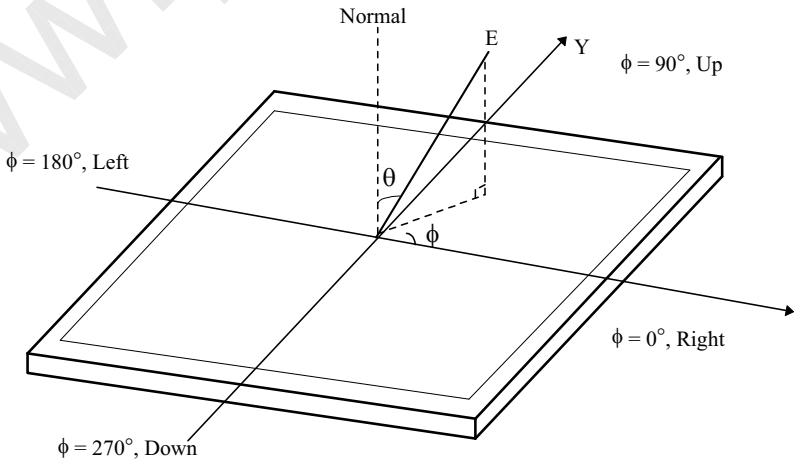
FIG. 9 Response Time



6. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG. 10 .

FIG. 10 Viewing Angle

<Dimension of viewing angle range>



Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

5. Mechanical Characteristics

The contents provide general mechanical characteristics. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	396.0 mm
	Vertical	324.0 mm
	Depth	20.0 mm
Bezel Area	Horizontal	380.3 mm
	Vertical	305.0 mm
Active Display Area	Horizontal	376.32 mm
	Vertical	301.056 mm
Weight	2586g(typ), 2700g(max)	
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer	

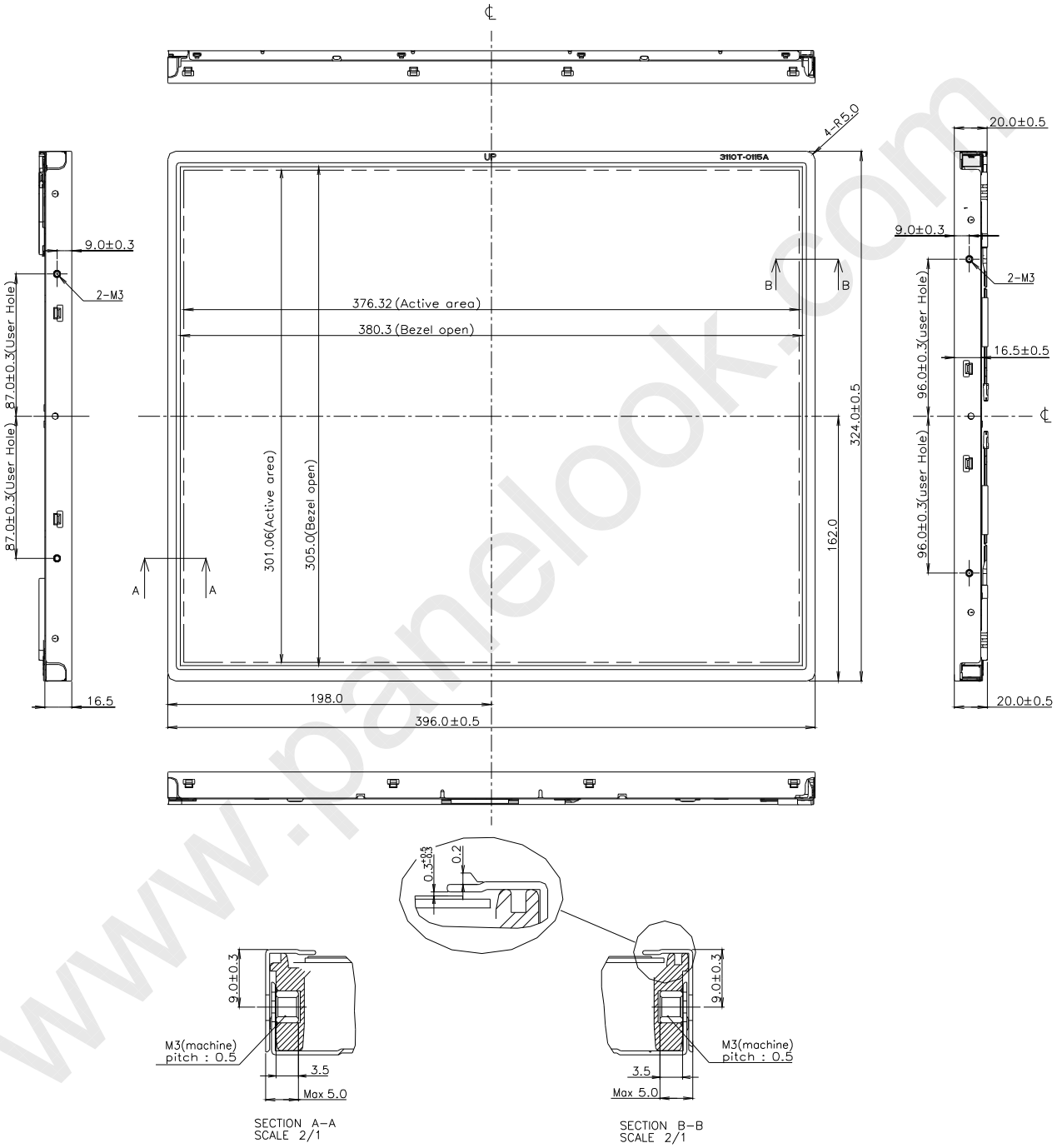
Notes : Please refer to a mechanical drawing in terms of tolerance at the next page.

www.panelook.com

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

<Front View>



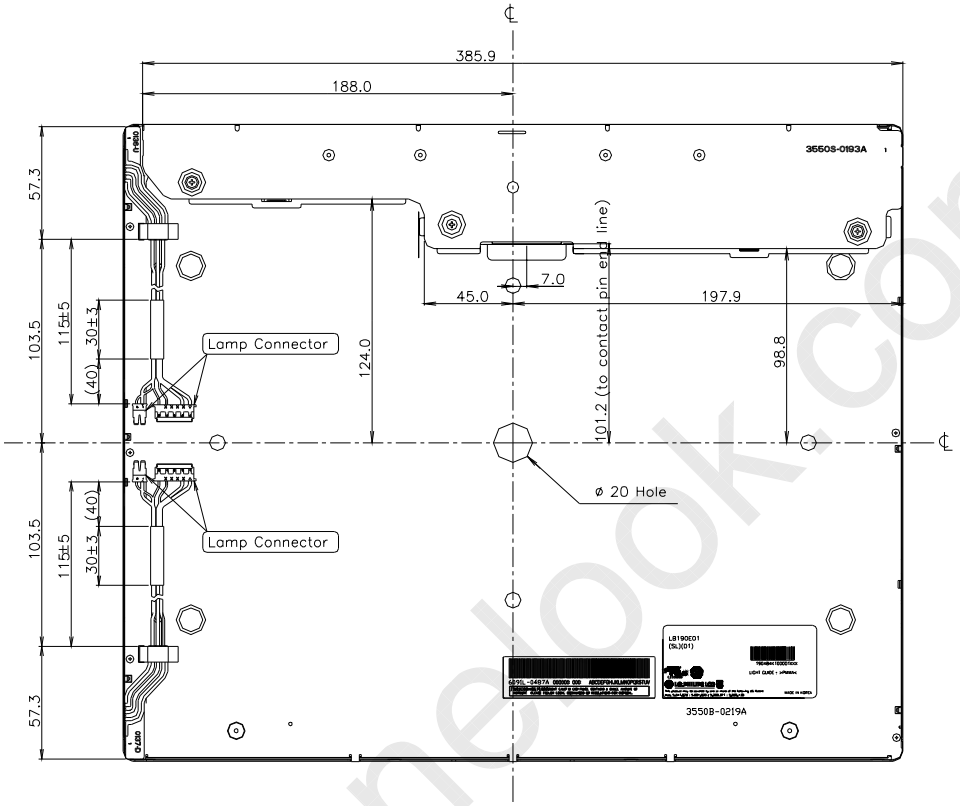
www.panelook.com

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

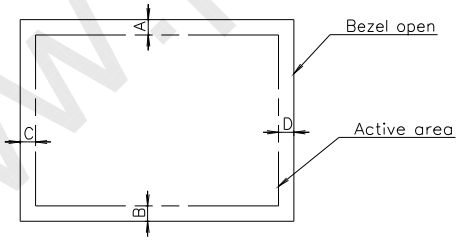
One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

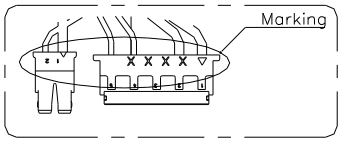
<Rear View>



Notes
1. Backlight : 6 Cold Cathode Fluorescent Lamps
2. I/F Connector Specification : GT101-30S-H16(LGC)/IN-30-BA 10(UJU)
3. Lamp Connector Specification
   - BHR-05VS-1(JST) or Compatible
   - BHSR-02VS-1(JST)
4. Torque of user hole : 3.5~4.0kgf-cm
5. Tilt and partial disposition tolerance of display area as following
   (1) Y-Direction : IA-BI <= 1.0
   (2) X-Direction : IC-DI <= 1.0



6. Lamp(CCFL) lot No. is marked at backlight connector



7. Do not wind conductive tape around the backlight wires
8. Unspecified tolerances to be ±0.5mm

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

6. Reliability

Environment test condition

No	Test Item	Condition
1	High temperature storage test	Ta= 60°C 240 hours
2	Low temperature storage test	Ta= -20°C 240 hours
3	High temperature operation test	Ta= 50°C 50%RH 240 hours
4	Low temperature operation test	Ta= 0°C 240 hours
5	Vibration test (non-operating)	Wave form : random Vibration level : 1.0G RMS Bandwidth : 10-300Hz Duration : X,Y,Z, 30 min for each of the three axes.
6	Shock test (non-operating)	Shock level : 100G Waveform : half sine wave, 2ms Direction : ±X, ±Y, ±Z One time each direction
7	Altitude operating storage / shipment	 0 - 10,000 feet(3048m) 0 - 40,000 feet(12,192m)

{ Result Evaluation Criteria }
There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

7. International Standards

7-1. Safety

a) UL 60950-1:2003, First Edition, Underwriters Laboratories, Inc.,
Standard for Safety of Information Technology Equipment.
b) CAN/CSA C22.2, No. 60950-1-03 1st Ed. April 1, 2003, Canadian Standards Association,
Standard for Safety of Information Technology Equipment.
c) EN 60950-1:2001, First Edition,
European Committee for Electro technical Standardization(CENELEC)
European Standard for Safety of Information Technology Equipment.

7-2. EMC

a) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. “American National Standards Institute(ANSI), 1992
b) C.I.S.P.R. “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.“ International Special Committee on Radio Interference.
c) EN 55022 “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.“ European Committee for Electro technical Standardization.(CENELEC), 1998
(Including A1: 2000)

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.
One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

2. MONTH

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial No. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

a) Package quantity in one box : 6 pcs

b) Box Size : 534mm X 311mm X 461mm.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

9. PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

9-1. MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the Module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
(7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can not be operated its full characteristics perfectly.
(8) A screw which is fastened up the steels should be a machine screw (if not, it causes metal foreign material and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com

Global LCD Panel Exchange Center www.panelook.com 屏库:全球液晶屏交易中心

9-3. ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

9-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9-5. STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

9-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

Note : This document is preliminary version. The latest version must be checked from LG.Philips LCD before detail design.

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com